

Qube Lite: Expanding Access to Emissions Monitoring

Ryeen Khondokar, Hicham Meziani, Johnson Xie, Syeda Islam, Andrine Buiza
Schulich School of Engineering, University of Calgary



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Our Sponsor

- Qube Technologies is a Calgary-based environmental tech company that develop low-cost emissions monitoring devices aimed at helping primary industries, such as oil and gas, detect, quantify, and reduce methane and other greenhouse gases.

Project Motivation

- Qube currently deploys Axon devices, a device that monitors for harmful gas leaks and displays all the emission data on their online dashboard
- To address the demand emissions monitoring device suitable for smaller sites, remote locations, challenging conditions such as Class 1 Division 1 areas, the Qube Lite was conceived.



Our Solution

Our tailored solution for the Qube Lite prototype includes:

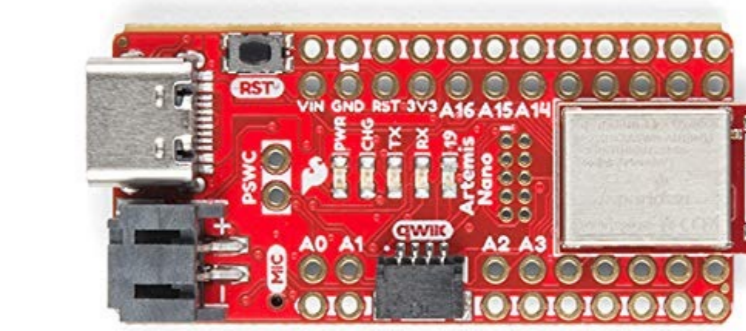
- Develop an efficient power supply architecture to maximize battery longevity and solar panel recharging functionality that can operate in Class 1 Division 1 areas
- Using a low energy consumption microcontroller, configure a methane sensor to operate continuously and accurately
- Established satellite communication for reliable data transfer to the Cloud with regular data transmissions of 5–10 minute intervals
- Design a PCB that can encompass all the hardware that is responsible for the functionalities listed above.

Key Components



GlobalStar SmartOne Solar:
Solar Panel and Modem

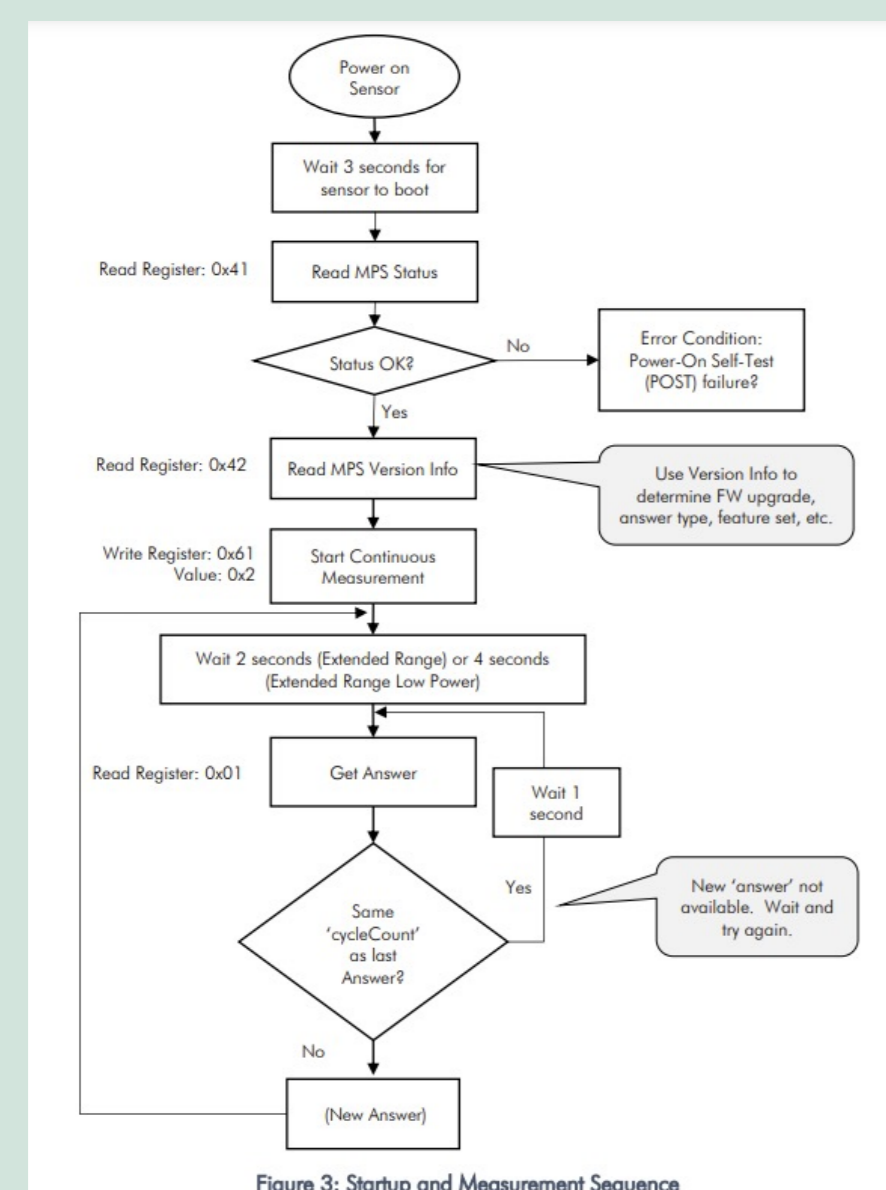
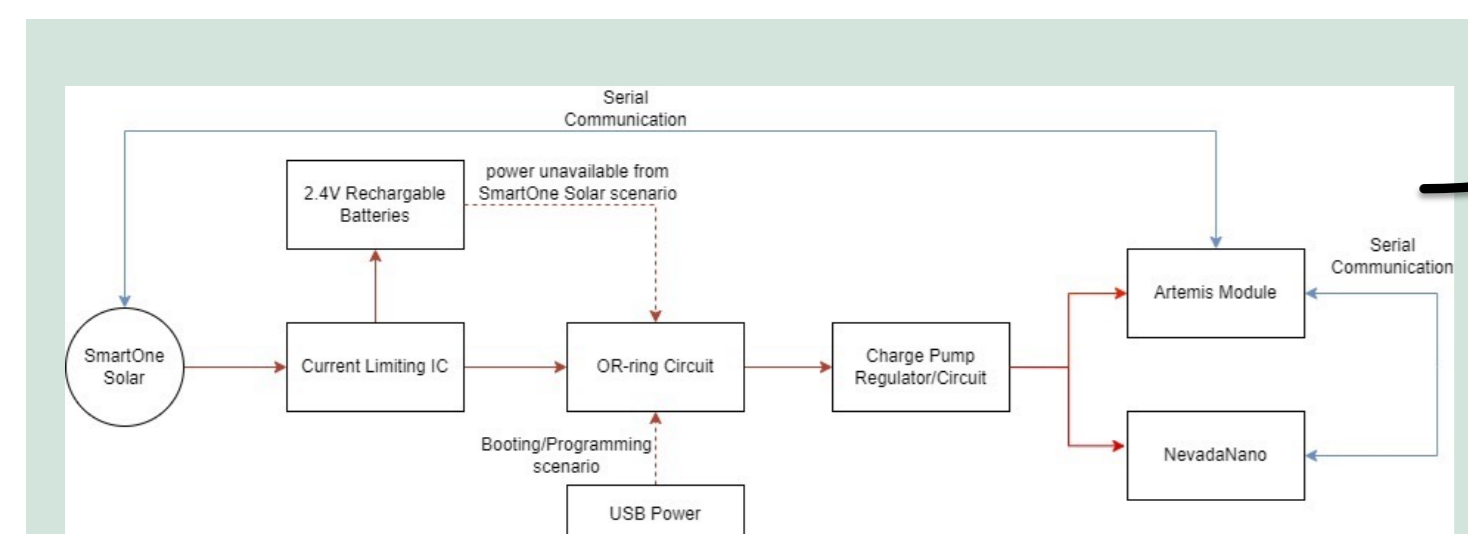
RedBoard Artemis Nano



NevadaNano
Methane Sensor

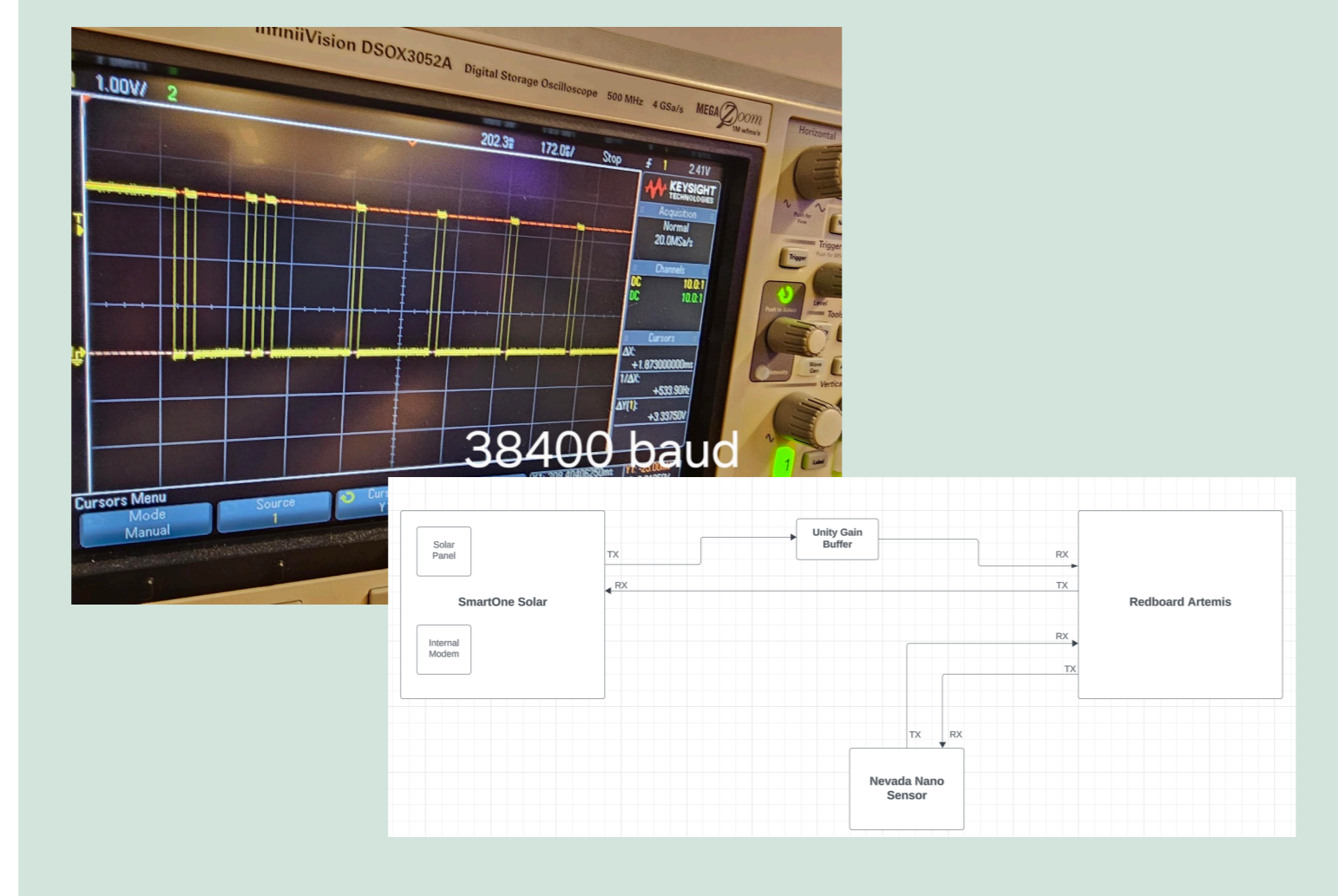
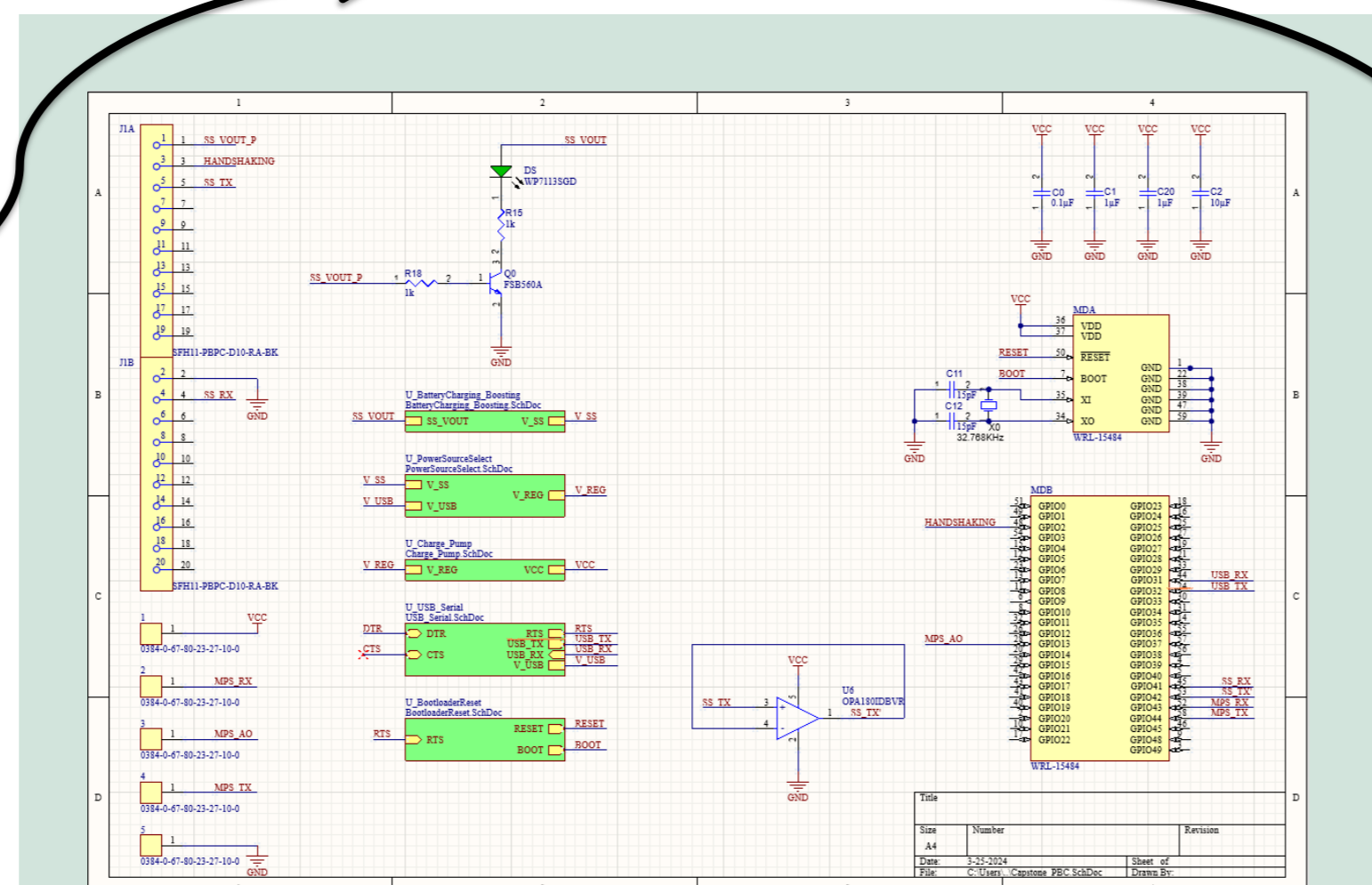
Design Process

Brainstorming



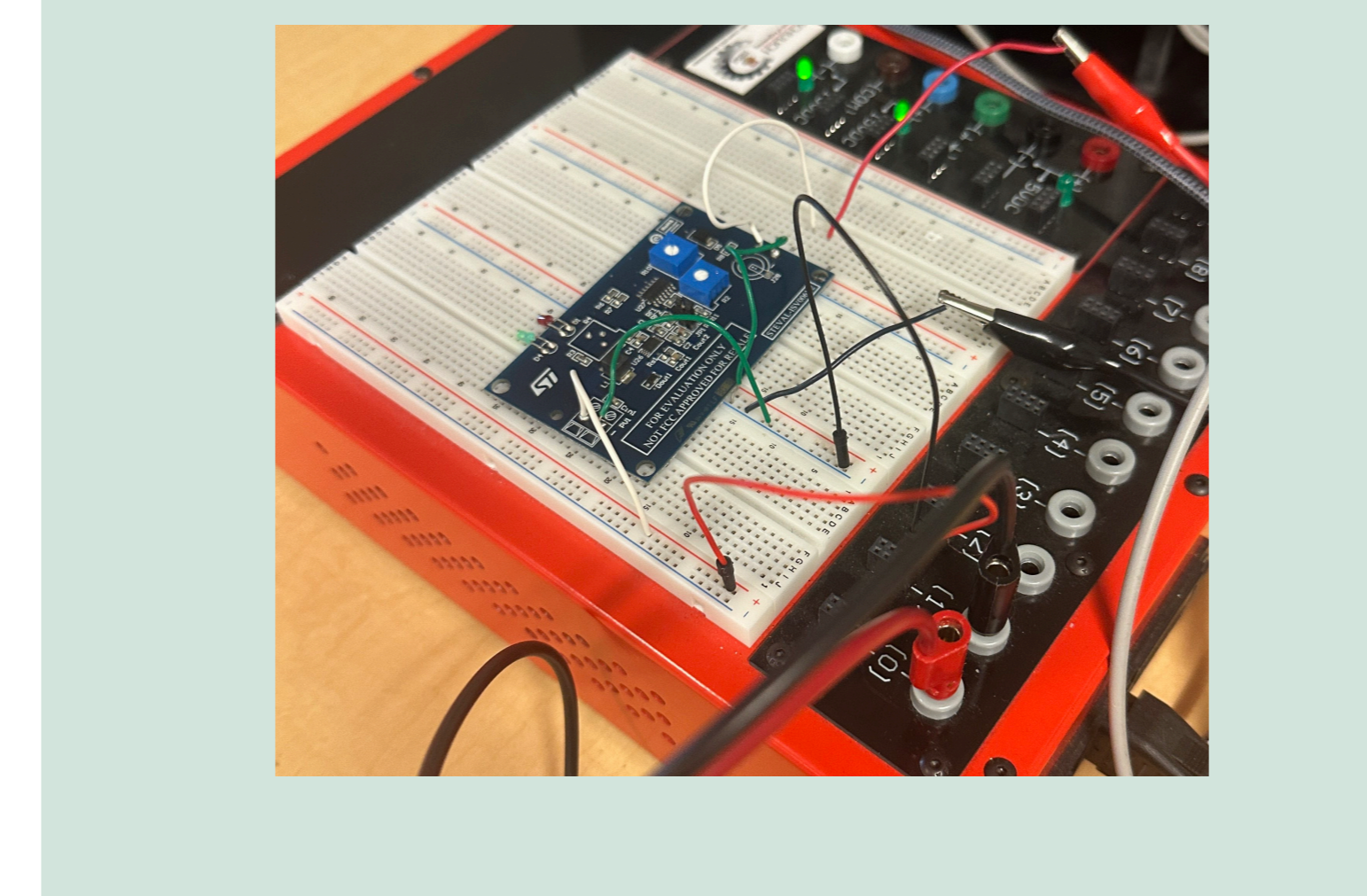
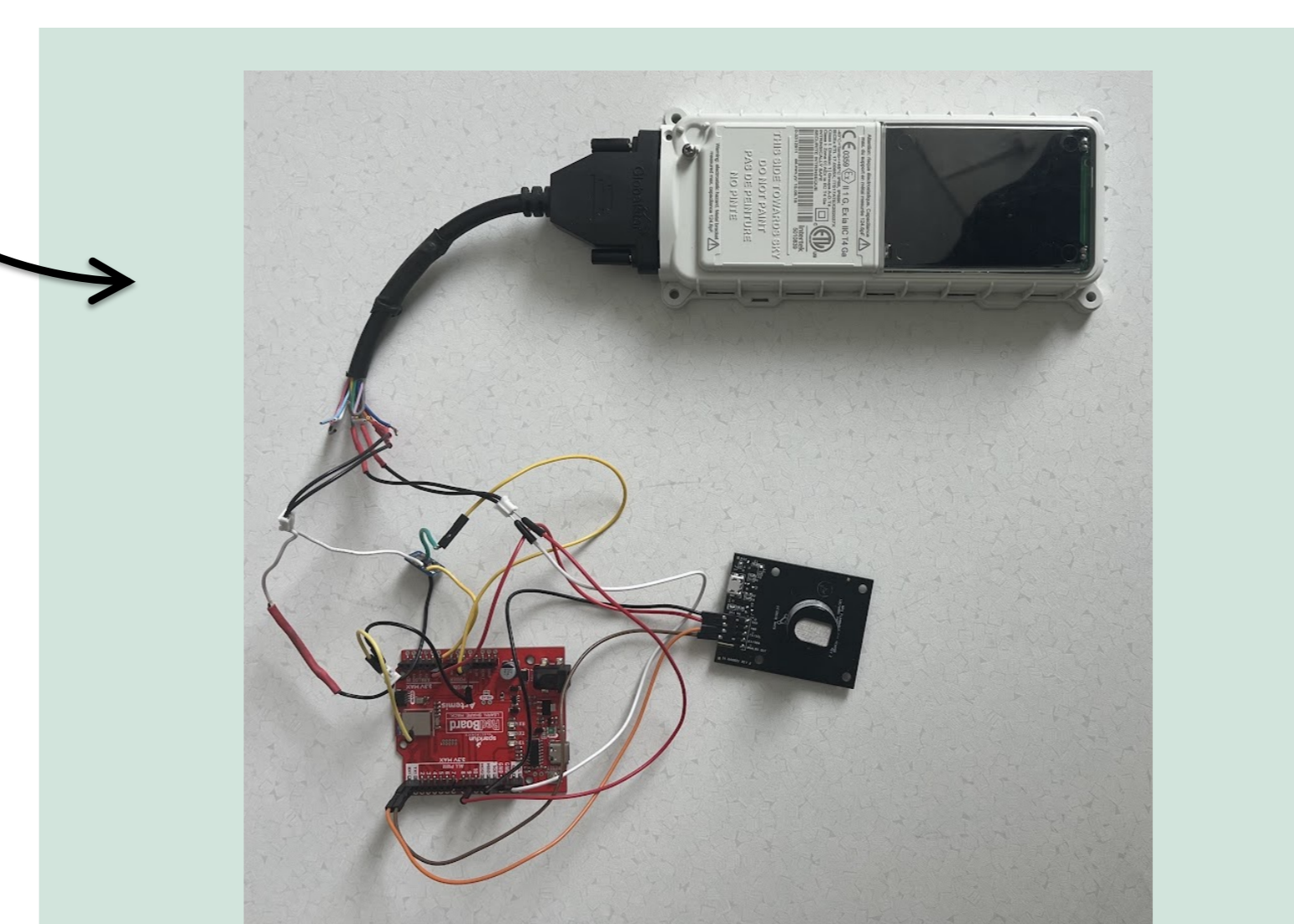
Created Flow Diagrams and Block Diagrams as well as learned necessary software to be used in the project, eg. Altium

Designing



Finalized Power Supply Schematic and Established UART communication between the SmartOne Solar, NevadaNano sensor, and Artemis Nano

Prototyping



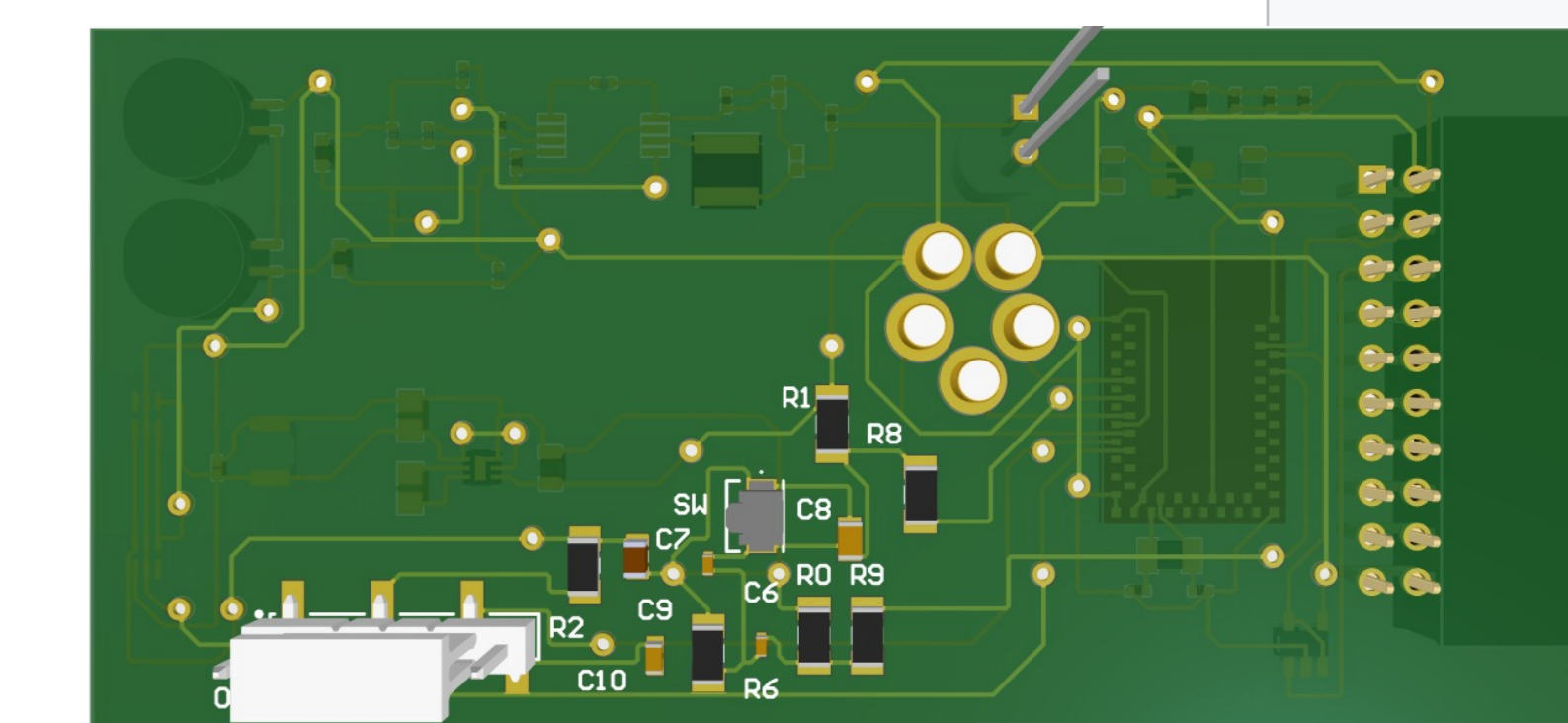
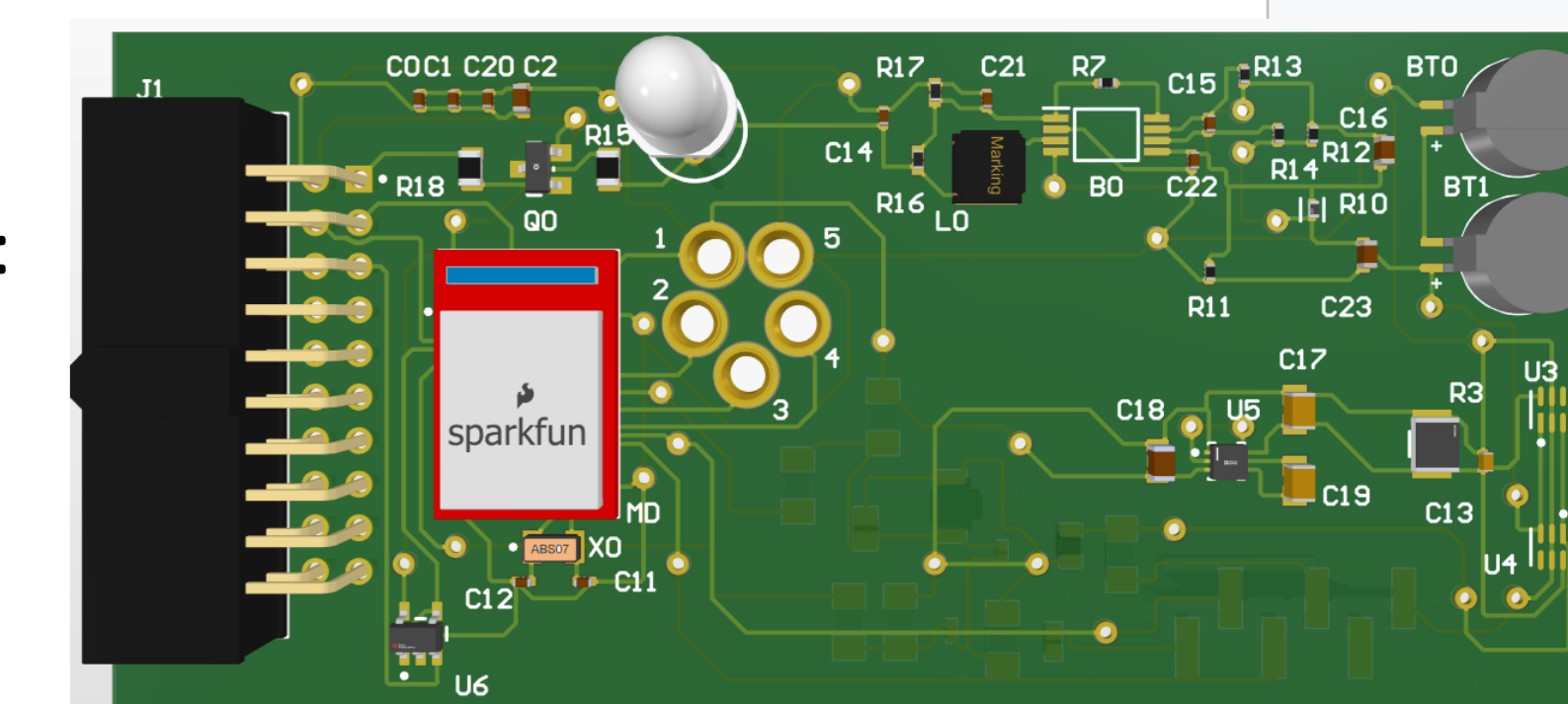
Soldered main components together and tested functionalities

Prototype Testing

Main components of Power Supply:

- Power Supply Board Output:** Varied tests confirmed voltage and current outputs within expected ranges.
- Charge Pump Circuit:** Achieved stable 3.3V output under different loads, confirming the circuit's effectiveness.
- OR-ring Circuit:** Verified no reverse current and proper voltage output.

Finalized Design of Qube Lite PCB



Data Transmission has also been tested:

- Satellite Data Transfer:** Tested SmartOne Solar panel/modem for functionality in both indoor and outdoor settings to ensure reliable satellite data transfer
- Sensor Data Acquisition:** Configured and validated Nevada Nano methane sensor readings through the Artemis Nanoboard using Arduino IDE.
- Email Payloads:** Implemented email messaging as a medium for receiving sensor data payloads.
- Data Visualization and Analysis:** Transformed raw sensor data payloads from emails into accessible, user-friendly readings on the Ubidots platform.

Data shown on Ubidots platform

Value	Name	Last updated
1	position	a few seconds ago
21.77	relative-humidity	a few seconds ago
23.21	temperature	a few seconds ago
4.52	absolute-humidity	a few seconds ago
88.11	pressure	a few seconds ago
1.8	methane-concentration	a few seconds ago